Review 3 Differentiable Functions

$f(x)$ is differentiable at $x=c$
means $f'(c)$ exists

$f(x)$ differentiable on $[a,b]$
$f'(x)$ exists at every point in $[a,b]$

not diff: cusp, corner, jump, hole, vertical tangent, VA

Feb 15-10:00 AM

$$\lim_{h\to 0}\frac{f(a+h)-f(a)}{h} = f'(a)$$ number

$$\lim_{b\to a}\frac{f(b)-f(a)}{b-a} = f'(a)$$

equation $$\lim_{h\to 0}\frac{f(x+h)-f(x)}{h} = f'(x)$$ slope function

Feb 15-10:06 AM

$$\lim_{h\to 0}\frac{\ln(2+h)-\ln(2)}{h} = \frac{1}{2}$$

der. of $\ln x$ at 2

$\frac{1}{x}$ at $x=2$

Feb 15-10:16 AM

$$f(x)=\begin{cases} 3-x, & x<1 \\ ax^2+bx, & x\geq 1 \end{cases}$$

a) what is the relation (equation) between a & b so $f(x)$ is continuous at $x=1$

b) Find the values (numbers) of a & b so $f(x)$ is differentiable at $x=1$

a) $\lim_{x\to 1^-} f(x) = \lim_{x\to 1^-} 3-x = 2$ so $\boxed{a+b=2}$

$\lim_{x\to 1^+} f(x) = \lim_{x\to 1} ax^2+bx = a+b$

lhd $= -1$

b) $f'(x)=\begin{cases} -1 & x<1 \\ 2ax+b & x\geq 1 \end{cases}$

rhd $f'(1) = 2a+b$

$\boxed{2a+b=-1}$

$2a+b=-1$
$-(a+b=2)$
$a=-3$ $\quad b=5$

Feb 15-10:19 AM

relation between diff & cont.

if diff then cont (has to)

if cont, not always diff

Feb 15-10:30 AM